Wissenschaftler: Fast 4 Jahrzehnte des Versagens von Klimamodellen untergraben das Vertrauen in deren Zukunftsprognosen

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IPCC-Modelle, die auf der Annahme beruhen, dass wir Menschen die Zirkulation des Atlantischen Ozeans mit unseren täglichen CO_2-Emissionen steuern können und dies auch tun, sind seit Mitte der 1980er Jahre falsch. Warum sollten wir noch an sie glauben?

Im jüngsten IPCC-Bericht heißt es weiterhin, es sei „sehr wahrscheinlich", dass sich die Atlantische Meridionale Ozeanzirkulation (AMOC), ein grundlegender Klimaparameter, im 21. Jahrhundert abschwächen (und Abkühlung, katastrophale Stürme, Dürre und Überschwemmungen auslösen) wird.

Wie die Autoren einer neuen Studie jedoch anmerken, stehen die 84 (CMIP5) und 56 (CMIP6) AMOC-Modelle seit Mitte der 1980er Jahre im Widerspruch zu den Beobachtungen, sowohl was das Ausmaß als auch das Vorzeichen betrifft. Die AMOC ist als Reaktion auf den Anstieg des atmosphärischen CO_2 nicht zurückgegangen. Es gibt sogar Anzeichen für einen Trendanstieg.

„Wir stellen fest, dass weder das CMIP5- noch das CMIP6-Ensemblemittel die AMOC-Beobachtungsdaten erfolgreich wiedergeben. … Wir zeigen, dass sowohl die Größe des Trends in der AMOC über verschiedene Zeiträume als auch oft sogar das Vorzeichen des Trends zwischen Beobachtungen und Klimamodell-Ensemblemittelwerten unterschiedlich sind, wobei die Größe des Trendunterschieds sogar noch größer wird, wenn man das CMIP6-Ensemble im Vergleich zu CMIP5 betrachtet."

Warum also, so fragen die Wissenschaftler, sollten wir den Vorhersagen der Zukunftsmodelle vertrauen?

„Wenn diese Modelle vergangene Schwankungen nicht reproduzieren können, warum sollten wir dann so zuversichtlich sein, dass sie die Zukunft simulieren können?"

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Can we trust projections of AMOC weakening based on climate models that cannot reproduce the past?

Gerard D. McCarthy[1] and Levke Caesar[2,3]

The Atlantic Meridional Overturning Circulation (AMOC), a crucial element of the Earth's climate system, is projected to weaken over the course of the twenty-first century which could have far reaching consequences for the occurrence of extreme weather events, regional sea level rise, monsoon regions and the marine ecosystem. The latest IPCC report puts the likelihood of such a weakening as 'very likely'. As our confidence in future climate projections depends largely on the ability to model the past climate, we take an in-depth look at the difference in the twentieth century evolution of the AMOC based on observational data (including direct observations and various proxy data) and model data from climate model ensembles. We show that both the magnitude of the trend in the AMOC over different time periods and often even the sign of the trend differs between observations and climate model ensemble mean, with the magnitude of the trend difference becoming even greater when looking at the CMIP6 ensemble compared to CMIP5. We discuss possible reasons for this observation-model discrepancy and question what it means to have higher confidence in future projections than historical reproductions.

Strictly speaking, there is not a single point in time for which a direct measurement of the full AMOC exists. Rather, the state of the AMOC is approximated by trans-basin observational systems that continuously monitor the meridional volume transport variability at different latitudes throughout the Atlantic [26]. The longest record of such a continuous directly measured AMOC time series is from the RAPID-MOCHA-WBTS programme [15], which started in 2004, and other observational programs have begun since then.

Going further back in time (i.e. pre-1993), observational evidence becomes even more sparse. The only direct observational evidence comes from five hydrographic sections taken in the years 1957, 1981, 1992, 1998 and 2004 [27].

After approximately 1985, the AMOC started to decline in both the CMIP5 and CMIP6 models with an increased slowdown after the year 2000. While the overall post-1950 trend is on average negative for the CMIP5 models, it is basically zero for the CMIP6 models. The larger standard deviation of the CMIP6 trends furthermore shows that the spread within these models is larger than the one within the CMIP5 models (table 1).

Table 1. Comparison of the linear trends (given in Sv/dec) found in the historical evolution of the AMOC in the CMIP5 and CMP6 model ensembles for different time periods. Linear trends were calculated for each model and ensemble member individually,

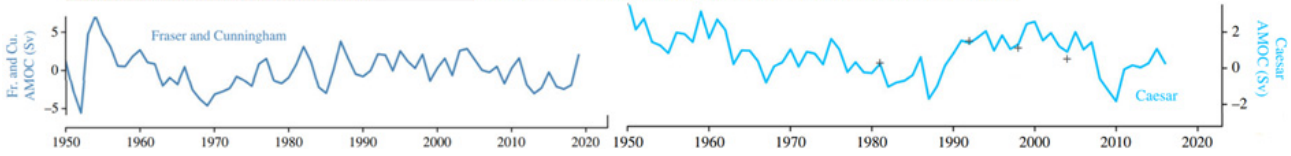
	1900–2000 [Sv/dec]	1950–2020* [Sv/dec]	1950–1985 [Sv/dec]	1985–2000 [Sv/dec]	2000–2020* [Sv/dec]
CMIP5	−0.04 ± 0.13	−0.14 ± 0.20	0.10 ± 0.33	−0.11 ± 0.92	−0.67 ± 0.58
CMIP6	0.07 ± 0.21	−0.00 ± 0.29	0.27 ± 0.43	−0.02 ± 1.00	−0.59 ± 0.67

Comparing the models' AMOC evolution to the observational data (figure 3, lower panel), we find that neither the CMIP5 nor the CMIP6 ensemble mean are successful at representing the observational AMOC data.

Potentially, we do not expect the historical climate models and the observations to match. Internal variability may dominate observations. The multi-model ensemble spread only barely encompasses the range of AMOC observations as shown in figure 3. This suggests that natural internal variability is very large and, while it does not exclude the possibility that certain model ensemble members capture the correct size of internal variability, suggests that it may be the limit of the models' ability to capture it. In this case, we do not expect the climate models to match observations, but can we explain the magnitude of internal variability and what are the implications for the future?

Of course, it could be that the models are wrong. They are missing important physical processes such as cryospheric, freshwater and deepwater formation processes. The impact of resolution (ocean and atmospheric grids) for air–sea interactions and their link with the AMOC needs to be better understood in coupled models.

We finish with a pessimistic statement: if it is not possible to reconcile climate models and observations of the AMOC in the historical period, then we believe the statements about future confidence about AMOC evolution should be revised. Low confidence in the past should mean lower confidence for the future! The IPCC AR6 report ranks it as *very likely* that the AMOC will decline in a changing climate. But, if these models cannot reproduce past variations, why should we be so confident about their ability to predict the future?



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Link:
https://notrickszone.com/2023/11/09/scientists-nearly-4-decades-of-climate-model-failure-undermines-confidence-in-future-predictions/

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